



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Or

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/874,606	06/05/2001	Stephen L. Skala	PHA 51243A	6706
24738	7590	01/29/2004	EXAMINER	
PHILIPS ELECTRONICS NORTH AMERICA CORPORATION INTELLECTUAL PROPERTY & STANDARDS 1109 MCKAY DRIVE, M/S-41SJ SAN JOSE, CA 95131			IM, JUNGHWA M	
			ART UNIT	PAPER NUMBER
			2811	

DATE MAILED: 01/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/874,606

Applicant(s)

SKALA ET AL.

Examiner

Junghwa M. Im

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 November 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-14 and 16-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-14 and 16-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rates (US 5,677,203) in view of Camilletti et al. (US 5,693,565), hereafter Camilletti.

Regarding claims 2, 6, 7, 8, 11 and 14, Fig. 1 of Rates shows a semiconductor chip comprising

an aluminum bond pad layer(12; col.5, line 28) over a die substrate and insulated on at least two sides by passivation material/electrically insulating means (24, 25);

a diffusion barrier layer/barrier means (20, 22; a field metal layer) over the aluminum bond pad, at least two entire sides by passivation material/electrically insulating means (24, 25); and

a metal layer over (18; gold) the die, the metal bond pad, the diffusion barrier layer/the barrier means and at least partially over, and in contact with, a portion of passivation material (electrically insulating means) not over the diffusion barrier layer, the metal layer being configured and arranged for connecting to a wire bond (through a connection to a metal lead 26) wherein the diffusion barrier layer/the barrier means is constructed to mitigate the inter-metallic aluminum/gold compound reaction (col.5, lines 26-36).

Fig. 1 of Rates shows substantially the entire claimed structure except “the diffusion barrier layer includes TiN.” Fig. 4 of Camilletti shows a TiN diffusion barrier layer (15A) formed between the aluminum bond pad (11A) and the gold metal layer (16A). It would have been obvious to one of ordinary skill in the art at the time of the invention to use TiN for the diffusion barrier layer (a field metal layer) in the Rates’ device with teachings of Camilletti in order to accommodate a process preference.

Note that Camilletti explicitly discloses that TiW or TiN can be used for a diffusion barrier layer (col.8, lines 37-44). And Rates discloses that a field metal layer (a diffusion barrier layer) is TiW. Therefore, using “TiN” instead of “TiW” for diffusion barrier layer is merely a preference over material during the process.

Regarding claims 3, 4 and 12, the combined teachings of Rates and Camilletti show substantially the entire claimed structure except the specified thickness of the TiN barrier layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to have a thickness of the TiN diffusion barrier layer recited in pending claim for better adhesion between the bond pad and the metal layer since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 9, the combined teachings of Rates and Camilletti shows substantially the entire claimed structure except the specified thickness of the TiN barrier layer and the metal layer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to have a thickness of the TiN diffusion barrier layer and the metal layer recited in pending claim for improved adhesion and connection between the bond pad and the metal layer

Art Unit: 2811

since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

In addition, Rates discloses a TiW diffusion barrier layer has a thickness of approximately 0.5 micron (col.6, lines 8-10).

Regarding claim 5, Rates shows a use for flip chip bonding (col. 2, lines 19-21).

Regarding claim 10, Camilletti shows that the metal bond pad and metal layer include the same type of metal (col. 8, line 8-14). It would have been obvious to have the same metal layers in the device of Rates with the teaching of since the homogeneous material between the two layers provide better adhesion thus, improving the performance of the device.

Note that Camilletti discloses that the bond pads are commonly made of aluminum and provide electrical connection in a integrated circuit (col.3, lines 38-42). And Camilletti further discloses that the metal layer can be *any metal*, which is electrically conductive and useful for interconnecting circuits of semiconductor die. Therefore, the metal layer and the bond pad of Camilletti could include the *same type* of metal.

Regarding claim 13, Rates discloses the diffusion barrier layer is constructed to mitigate inter-metallic aluminum/gold compound reaction (col.5, lines 26-36).

Claims 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weiler (US 5,559,056) in view of Camilletti.

Regarding claim 16, Fig. 2 of Weiler shows a semiconductor chip comprising:

a metal bond pad layer(26) over a substrate having a circuit (22; col.4, lines 8-10);

a diffusion barrier layer(28) over the metal bond pad; and

a metal layer over (30) the diffusion barrier layer and the metal layer being configured and arranged for connecting to a wire bond, and the metal bond pad, the diffusion barrier layer and the metal layer all being insulated on at two sides by passivation material(24; col.2, lines 28-31);

wherein the diffusion barrier layer is constructed to mitigate inter-metallic compound reaction (col.4, lines 49-53), and the passivation material is arranged to be at least partially over the metal bond pad and the diffusion barrier.

Fig. 2 of Weiler shows substantially the entire claimed structure except “the diffusion barrier layer includes TiN.” Fig. 4 of Camilletti shows a TiN diffusion barrier layer (15A) formed between the aluminum bond pad (11A) and the gold metal layer (16A). It would have been obvious to one of ordinary skill in the art at the time of the invention to use TiN for the diffusion barrier layer (a field metal layer) in the Weiler’ device with teachings of Camilletti in order to accommodate a process preference.

Note that Camilletti explicitly discloses that TiW or TiN can be used for a diffusion barrier layer (col.8, lines 37-44). And Weiler discloses that a diffusion barrier layer is TiW. Therefore, using “TiN” instead of “TiW” for diffusion barrier layer is merely a preference over material during the process.

Regarding claim 17, Weiler shows that the diffusion barrier layer is constructed and arranged to mitigate inter-metallic Al/Au compounds forming as a reaction to the metal layer Al/Au connecting to the wire bond (col.4, lines 49-53).

Regarding claim 18, the combined teachings of Weiler and Camilletti shows substantially the entire claimed structure except “the diffusion barrier layer has a thickness of that is at least

Art Unit: 2811

0.5 micron.” However, it would have been obvious to one of ordinary skill in the art at the time of the invention to have a thickness of the diffusion barrier layer recited in pending claim for a better bonding between the bond pad and the metal layer, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 19, the combined teachings of Weiler and Camilletti shows substantially the entire claimed structure except “the metal layer has a thickness of that is at least 3 micron.” However, it would have been obvious to one of ordinary skill in the art at the time of the invention to have a thickness of the metal layer recited in pending claim to accommodate a design preference, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 20, Camilletti shows a flip chip application (col. 3, lines 41-42).

Response to Arguments

Applicant's arguments filed November 4, 2003 have been fully considered but they are not persuasive. The rejection stands, modified only to accommodate the amendments made to the claims by Applicant. New rejections are made in response to Applicant's amended claims.

Conclusion

Art Unit: 2811

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (703) 305-3998. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on (703) 308-1690. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

Jmi
January 23, 2004